

U.S. Department of Commerce, Patent and Trademark Office					Attorney Docket No. <b>#16</b>		Serial No.	
					NAN022 US		09/670,000	
<b>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</b> (Use several sheets if necessary)					Examiner			
					Kao, Chih-Cheng G.			
					Filing Date		Group	
					Sept. 25, 2000		2882	

U.S. Patent Documents							
*Examiner Initial	Document Number	Date	Name	Class	Subclass	Filing Date If Appropriate	
<i>K</i>	46.	5,880,838	Mar. 9, 1999	Marx et al.	356	351	

Foreign Patent Documents							Translation	
Document	Date	Country	Class	Subclass	Yes	No		

OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.)		

Examiner <i>K</i>	Date Considered <b>2/17/04</b>
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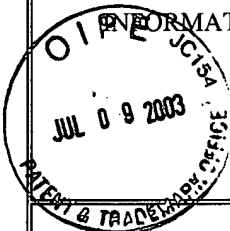
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U.S. Department of Commerce, Patent and Trademark Office

Application No.: 09/670,000  
 Filing Date: September 25, 2000  
 First Named Inventor: James M. Holden  
 Group Art Unit: 2882  
 Examiner Name: Chih-Cheng Glen Kao  
 Confirmation No.: 3656  
 Attorney Docket No.: NAN022 US

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U.S. Patent Documents

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<i>[Signature]</i>	79. US 2002/0038196	Mar. 28, 2002	Johnson et al.	702	179	
<i>[Signature]</i>	80. 6,556,947	Apr. 29, 2003	Scheiner et al.	702	172	

Foreign Patent Documents

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*[Signature]*


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










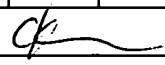
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	1.	5,042,951	Aug. 27 1991	Gold et al.	356	369		
	2.	6,097,488	Aug. 1, 2000	Grek et al.	356	364		
	3.	6,281,974	Aug. 28, 2001	Scheiner et al.	356	381		
	4.	6,366,861 B1	Apr. 2, 2002	Waldhauer et al.	702	35		
	5.	US 2002/0018217	Feb. 14, 2002	Weber-Grabau et al.	356	601		
	6.	US 2002/0033945	Mar. 21, 2002	Xu et al.	356	369		
	7.	US 2002/0033954	Mar. 21, 2002	Niu et al.	356	601		
	8.	US 2002/0035455	Mar. 21, 2002	Niu et al.	703	4		
Foreign Patent Documents								
							Translation	
		Document	Date	Country	Class	Subclass	Yes	No
	✓	9. EP 0 402 191 B1	Dec. 12, 1990	Europe			Claims	
	✓	10. WO 02/25723 A2	Mar. 28, 2002	PCT	H01L	21/66		✓
	✓	11. WO 02/27288 A1	Apr. 4, 2002	PCT	G01J	3/28		✓
OTHER ART (Including Author, Title, Date, Pertinent Pages, Etc.)								
	✓	12.	Bischoff J. et al., "Modeling of optical scatterometry with finite-number-of-periods gratings", <i>SPIE</i> Vol. 3743 (1999) Pages 41-46.					
	✓	13.	Bishop, K. P. et al., "Grating line shape characterization using scatterometry", <i>SPIE</i> , Vol. 1545 (1991) Pages 64-73.					
	✓	14.	Bishop, K. P. et al., "Use of scatterometry for resist process control", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 1673 (1992) Pages 441-52.					
	✓	15.	Coulombe, S. A. et al., "Modal characteristics of short-pitch photoresist gratings exhibiting zero-order diffraction anomalies", <i>J. Opt. Soc. Am. A</i> , Vol. 16, No.12 (Dec. 1999), Pages 2904-2913.					
	✓	16.	Coulombe, S. A. et al., "Scatterometry measurement of sub-0.1 $\mu\text{m}$ linewidth gratings", <i>J. Vac. Sci. Technol. B</i> , Vol. 16, No. 1 (1998) Pages 80-87.					
	✓	17.	Gaspar, S. M. et al., "Laser scatterometry for process characterization", <i>AIP Conference Proceedings</i> , Vol. 227, No. 1, (1991) Pages 54-55.					
	✓	18.	Hatab, Ziad R. et al., "Sixteen-megabit dynamic random access memory trench depth characterization using two-dimensional diffraction analysis", <i>J. Vac. Sci. Technol. B</i> , Vol. 13, No. 2 (1995) Pages 174-182.					
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<del>✓</del>	✓	18.	Hickman, K. C. et al., "Use of diffracted light from latent images to improve lithography control", <i>J. Vac. Sci. &amp; Tech. B</i> , Vol. 10, No. 5 (1992) Pages 2259-2266.
	✓	19.	Krukar, R. H. et al., "Analyzing simulated and measured optical scatter for semiconductor process verification", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 1907 (1993) Pages 238-49.
	✓	20.	Krukar, R. H. et al., "Using scattered light modeling for semiconductor critical dimension metrology and calibration", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 1926 (1993) Pages 60-71.
	✓	21.	Krukar, R. H. et al., "Wafer examination and critical dimension estimation using scattered light" <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 1661 (1992) Pages 323-32.
	✓	22.	Logofatu, P. C. et al. "Identity of the cross-reflection coefficients for symmetric surface-relief gratings", <i>J. Opt. Soc. Am. A, Opt.</i> Vol. 16 No. 5 (May 1999) Pages 1108-1114.
	✓	23.	Logofatu, P. C. et al., "Sensitivity analysis of fitting for scatterometry", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 3677 (1999) Pages 177-183.
	✓	24.	McNeil, J. R., "Instrumentation to Enhance Optical Scatterometry for Semiconductor Metrology Development", Final Rept. 1 Sep 93-28 Feb 98, Contract Number F49620-93-1-0512, Defense Technical Information Center (DTIC) order number- AD-A354-189 (1998) (23 pages).
	✓	25.	McNeil, J. R. et al., "Application of optical scatterometry to microelectronics processing", <i>Technical Digest. Summaries of Papers Presented at the Conference on Lasers and Electro-Optics.</i> , Vol.6 (1998) Pages 348-349.
	✓	26.	McNeil, J. R. et al., "Scatterometry applied to microelectronics processing", <i>Solid State Technol.</i> , Vol. 36, No. 3 (1993) Pages 29-30.
	✓	27.	McNeil, J. R., et al., "Scatterometry applied to microelectronics processing" <i>Solid State Technol.</i> Vol. 36, No. 4 (1993) Pages 53-6.
	✓	28.	Milner, L. M et al., "Latent image exposure monitor using scatterometry", <i>SPIE Proceedings</i> , Vol. 1673 (1992), 10 pages.
	✓	29.	Milner, L. M. et al., "Lithography process monitor using light diffracted from a latent image", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 1926 (1993) Pages 94-105.
	✓	30.	Minhas, B. K. et al., "Ellipsometric scatterometry for the metrology of sub-0.1- $\mu\text{m}$ -linewidth structures", <i>Applied Optics</i> , Vol. 37, No. 22 (Aug., 1998) Pages 5112-5115.
<del>✓</del>	✓	31.	Minhas, B. K. et al., "Towards sub-0.1 $\mu\text{m}$ CD measurements using scatterometry", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 2725 (1996) Pages 729-39.
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	32.	Murnane, M. R. et al., "Scatterometry for 0.24 $\mu$ -0.70 $\mu$ m developed photoresist metrology", <i>SPIE</i> , Vol. 2439 (1995) pages 427-436.	
	33.	Murnane, M. R. et al., "Subwavelength photoresist grating metrology using scatterometry", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 2532 (1995) Pages 251-261.	
	34.	Naqvi, S. S. H. et al., "A simple technique for linewidth measurement of gratings on photomasks", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 1261 (1990) Pages 495-504.	
	35.	Naqvi, S. S. H. et al., "Diffraction techniques for lithographic process monitoring and control", <i>J. Vac. Sci. Technol. B</i> , Vol. 12, No. 6 (1994) Pages 3600-3606.	
	36.	Naqvi, S. S. H. et al., "Etch depth estimation of large-period silicon gratings with multivariate calibration of rigorously simulated diffraction profiles", <i>J. Opt. Soc. Am. A</i> , Vol. 11, No. 9 (1994) Pages 2485-2493.	
	37.	Naqvi, S. S. H. et al. "Grating parameter estimation using scatterometry" <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 1992 (1993) Pages 170-180.	
	38.	Naqvi, S. S. H. et al., "Linewidth measurement of gratings on photomasks: a simple technique", <i>Applied Optics</i> , Vol. 31, No. 10 (1992) Pages 1377-1384.	
	39.	Naqvi, S. S. H., et al., "Optical scatterometry for process metrology", <i>Optical metrology; Proceedings of the Conference</i> , (July 1999) Pages 129-144.	
	40.	Prins, S. L. et al., "Scatterometric sensor for PEB process control", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 2725 (1996) Pages 710-719.	
	41.	Raymond, C. J. et al., "Multiparameter CD measurements using scatterometry", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 2725 (1996) Pages 698-709.	
	42.	Raymond, C. J. et al., "Multiparameter grating metrology using optical scatterometry" <i>J. of Vac. Sci. Tech. B</i> , Vol. 15, No. 2 (1997) pages 361-368.	
	43.	Raymond, C. J. et al., "Multi-parameter process metrology using scatterometry", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 2638 (1995) Pages 84-93.	
	44.	Raymond, C. J. et al., "Scatterometry for CD measurements of etched structures", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 2725 (1996) Pages 720-728.	
	45.	Wilson, S. M. G. et al., "Phase shift mask metrology using scatterometry", <i>Proc. SPIE - Int. Soc. Opt. Eng.</i> , Vol. 2322 (1994) Pages 305-315.	
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Application No.:	09/670,000
Filing Date:	September 25, 2000
First Named Inventor:	James M. Holden
Group Art Unit:	2882
Examiner Name:	Chih-Cheng Glen Kao
Confirmation No.:	3656
Attorney Docket No.:	NAN022 US

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<i>CE</i>		5,900,633	May 4, 1999	Solomon et al.	250	339.08	
	48.	6,429,930 B1	Aug. 6, 2002	Littau et al.	356	124	
	49.	6,429,943 B1	Aug. 6, 2002	Opsal et al.	356	625	
	50.	6,476,920 B1	Nov. 5, 2002	Scheiner et al.	356	630	
	51.	US 2002/0024669	Feb. 28, 2002	Danner et al.356	356	369	
	52.	US 2002/0051564	May 2, 2002	Benesh et al.	382	145	
	53.	US 6,483,580 B1	Nov. 19, 2002	Xu et al.	356	300	
	54.	6100,985	Aug. 8, 2000	Scheiner et al.	356	381	
<i>CE</i>	55.	5,889,593	Mar. 30, 1999	Bareket	356	445	

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<i>CE</i>	✓	56.	Ahmed, S., et al., "Comparison of beam propagation method and rigorous coupled-wave analysis for single and multiplexed volume gratings", Applied Optics, Vol. 35, No. 22, August 1, 1996, pp. 4426-4435.
	✓	57.	Chateau, N, et al., "Algorithm for the rigorous coupled-wave analysis of grating diffraction" Journal of the Optical Society of America A: Optics and Image Science Vol. 11, No. 4, Apr 1994, p 1321-1331.
	✓	58.	Dong Hoon Lee, et al., "Analysis of topological effects of phase-shifting mask by boundary element method", J. Inst. Electron. Eng. Korea D (South Korea), Vol. 36-D, No. 11, Nov. 1999, pp. 33-44.
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	✓	60.	Han, Chang-Wook, et al., "Rigorous coupled-wave analysis of antireflective surface-relief gratings" J. Opt. Soc. Korea (South Korea) Vol. 1, No. 1, March 1997, pp. 26-35.
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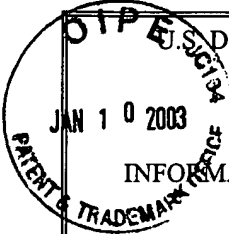
<input checked="" type="checkbox"/>	62.	Jarem, J. M., et al., "Rigorous coupled-wave analysis of photorefractive reflection gratings", J. Opt. Soc. Am. B, Opt. Phys. (USA) Vol. 15, No. 7, July 1998, pp. 2099-106.
<input checked="" type="checkbox"/>	63.	Jarem, J.M. "A rigorous coupled-wave analysis and crossed-diffraction grating analysis of radiation and scattering from three-dimensional inhomogeneous objects" IEEE Transactions on Antennas and Propagation, Vol. 46, No. 5, May 1998, p. 740, 741.
<input checked="" type="checkbox"/>	64.	Jiang Yongyuan, et al., "Rigorous coupled wave analysis of dynamic diffraction properties of photorefractive phase grating Acta Photonica Sin. (China) Vol. 29, No. 3, March 2000, pp. 216-22.
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<input checked="" type="checkbox"/>	66.	Kamiya, N., "Rigorous coupled-wave analysis for practical planar dielectric gratings. 1. Thickness-changed holograms and some characteristics of diffraction efficiency", Appl. Opt. (USA) Vol. 37, No. 25, 1 Sept. 1998, pp. 5843-53
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





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	72.	Moharam, M.G. et.al, "Rigorous Coupled-Wave Analysis of Grating Diffraction- E-mode polarization and losses", Jnl. of the Optical Society of America, Vol. 73, No. 4, April 83, p451-455.
	73.	Moharam, M.G. et.al, "Rigorous coupled-wave analysis of metallic surface-relief gratings" Optical Society of America, Journal, A: Optics and Image Science Optical Society of America, Journal, A: Optics and Image Science, Vol. 3, Nov. 1986, p. 1780-1787
	74.	Nakagawa, W., et al., "Analysis of near-field effects in artificial dielectric structures using rigorous coupled-wave analysis", Conference Proceedings - Lasers and Electro-Optics Society Annual Meeting- LEOS, Vol. 2, 1999, p 495-496
	75.	Peng, Song, et al., "Efficient and stable implementation of rigorous coupled-wave analysis for surface-relief gratings", Proc. SPIE - Int. Soc. Opt. Eng. (USA), Vol. 2532, 1995, pp. 475-80
	76.	Peng, Song, et al., "Efficient implementation of rigorous coupled-wave analysis for surface-relief gratings", Journal of the Optical Society of America A: Optics and Image Science, and Vision, Vol. 12, No. 5, May 1995, p 1087-1096.
	77.	Stover, J. C., et al., "Modeled and measured scatter from vias", SPIE Conf on Surface Characterization of Computer Disks, Wafers, and Flat Panel Displays, January 1999, pp, 65-71.
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